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DOCUMENT INFORMATION

Sheet 1 of 1

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Author(s): Vyacheslav Maizel, Mark A. Friedrich

Principal author signature: Vyacheslav Maizel Mark A Friedrich

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Checked by: Randy Meinert
Randy Mein

Checker signature:

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Approver signature: Stephen E. Anderson

MARK A. FRIEDRICH
STATE OF WASHINGTON
32426
REGISTERED
PROFESSIONAL ENGINEER
Mark A Friedrich
8-27-04
EXPIRES: 08/31/04

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River Protection Project
Waste Treatment Plant
2435 Stevens Center Place
Richland, WA 99352
United States of America
Tel: 509 371 2000

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History Sheet

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Contents

Figures

Acronyms and Abbreviations

Reference the *P&ID Symbols and Legend Sheets*, as listed in the Applicable Documents section, for acronyms and abbreviations employed on the attached figures.

FEP	waste feed evaporation process
FRP	waste feed receipt process
HLP	HLW lag storage and feed blending process
HLW	high-level waste
LAW	low-activity waste
LOL	lower operating limit
PCS	process control system
PTF	pretreatment facility
PWD	plant wash and disposal
SHR	sodium hydroxide reagent
TCP	treated LAW concentrate storage process
TFC	tank farm contractor
UFP	ultrafiltration process
UOL	upper operating limit
WTP	River Protection Project - Waste Treatment Plant

Glossary

acquire	Acquire is a command under a batch control that reserves a group of equipment for that particular batch control.
actual volume	Actual volume is amount, in US gallons, of the waste and process fluid in any vessel.
available space	Available space refers to the volume, in US gallons, of waste and process fluid that any vessel can accommodate and still be lower than the upper operating limit (UOL). Available space can be calculated as follows: *Available Space = UOL - Actual Volume*
available volume	Available volume refers to the volume, in US gallons, of waste and process fluid that any vessel can transfer to another vessel and still be above the lower operating limit (LOL). Available volume can be calculated as follows: *Available Volume = Actual Volume - LOL*
batch	This refers to material that is being produced or that has been produced by a single execution of a batch process.
batch control	This term refers to control activities and control functions that provide a means to process finite quantities of material over a finite period of time using one or more pieces of equipment and ordered set of processing activities.
exception handling	This term refers to the functions that deal with plant or process contingencies and other events that occur outside the normal or desired behavior of batch control.
permissive	A permissive is an interlock that allows a device to change state or allows a sequence to start. Once a device has changed state or a sequence started, a permissive has no further effect on the device or sequence.
release	Release is a command under a batch control that opens up a group of equipment for any batch control to acquire.
trip	A trip is a conditional interlock that forces a device or a sequence to a defined state. A trip continues to have an effect on the device or sequence until the interlock condition no longer exist.

1 Introduction

This document describes the control logic for dangerous waste regulated systems and components for the waste feed receipt process (FRP) system within the pretreatment (PT) facility.

2 Applicable Documents

24590-PTF-M6-FRP-P0001, *P&ID - PTF. Waste Feed Receipt Vessels FRP-VSL-00002A and FRP-VSL-00002B (Q).*

24590-PTF-M6-FRP-P0002, *P&ID - PTF. Waste Feed Receipt Vessels FRP-VSL-00002C and FRP-VSL-00002D (Q).*

24590-PTF-M6-FRP-P0003, *P&ID - PTF. Waste Feed Receipt Process System FRP-PMP-00001 and FRP-PMP-00002 (Q).*

24590-PTF-M6-FRP-P0005, *P&ID - PTF. Waste Feed Receipt Utility Services - PSA Rack (Q).*

24590-PTF-M6-FRP-P0006, *P&ID - PTF. Waste Feed Receipt Utility Services - PSA Rack (Q).*

24590-PTF-M6-FRP-P0007, *P&ID - PTF. Waste Feed Receipt Utility Services - PSA Rack (Q).*

24590-PTF-M6-FRP-P0008, *P&ID - PTF. Waste Feed Receipt Utility Services - PSA Rack (Q).*

24590-WTP-M6-50-P0001, *P&ID Symbols and Legend Sheet 1 of 6.*

24590-WTP-M6-50-P0002, *P&ID Symbols and Legend Sheet 2 of 6.*

24590-WTP-M6-50-P0003, *P&ID Symbols and Legend Sheet 3 of 6.*

24590-WTP-M6-50-P0004, *P&ID Symbols and Legend Sheet 4 of 6.*

24590-WTP-M6-50-P0005, *P&ID Symbols and Legend Sheet 5 of 6.*

24590-WTP-M6-50-P0006, *P&ID Symbols and Legend Sheet 6 of 6.*

24590-PTF-3YD-FRP-00001, *System Description for Waste Feed Receipt Process (FRP).*

3 Description

3.1 System Requirement

The vessels and pumps (along with corresponding valves and instruments) associated with dangerous waste management within the FRP system are the following:

FRP-VSL-00002A	waste feed receipt vessel
FRP-VSL-00002B	waste feed receipt vessel
FRP-VSL-00002C	waste feed receipt vessel
FRP-VSL-00002D	waste feed receipt vessel
FRP-PMP-00001	waste feed return pump
FRP-PMP-00002A	waste feed transfer pump

3.1.1 Waste Feed Receipt Vessels

Waste feed receipt vessels (FRP-VSL-00002A, FRP-VSL-00002B, FRP-VSL-00002C, and FRP-VSL-00002D) are identical.

Instrumentation, alarms, controls, and interlocks will be provided for the FRP system to indicate or prevent the following conditions:

- Vessel contents overflow (level indication)
- Loss of system integrity (vessel level indication)
- Inadvertent transfer (permissive signals to transfer pumps)
- Inaccurate vessel level (density compensation to indicate true level)
- Excessive temperature (temperature monitoring)

The four waste feed receipt vessels are primarily used to receive waste feed from the tank farm contractor (TFC). The waste will then be transferred to either the ultrafiltration feed preparation vessels (UFP-VSL-00001A and UFP-VSL-00001B) or the waste feed evaporator feed vessels (FEP-VSL-00017A and FEP-VSL-00017B).

The waste is received from the TFC through the inner pipe of any of three coaxial transfer pipes. These pipes, equipped with leak detection systems, allow receipt of the waste into the four waste feed receipt vessels. The piping system is also available to allow transfer of waste from one vessel to another, as well as allowing storage and return of waste from the PT facility.

When a waste feed receipt vessel (FRP-VSL-00002A, FRP-VSL-00002B, FRP-VSL-00002C, or FRP-VSL-00002D) is ready to receive feed from the TFC or any source within the PT facility (systems FRP, TCP, FEP, or HLP), the FRP operator will initiate the transfer-in batch control operation. This operation will prompt the operator to confirm that all pre-start administrative control requirements are satisfied. The sequence will not proceed until the operator acknowledges the prompt. At this time, the control system will monitor the parameters that constitute permissive or trip interlocks and perform the data transfer between the FRP control system and the TFC. Once the prompt is acknowledged by the operator and the transfer line is selected, the process control system (PCS) will automatically align all necessary valves. The position feedback switches of these valves are monitored by the PCS. If any of the valves are not in the correct position, the sequence will be switched to an exception logic that stops transferring and initiates pre-defined corrective action.

For better control of any transfer operation for any of the waste feed receipt vessels (FRP-VSL-00002A, FRP-VSL-00002B, FRP-VSL-00002C, and FRP-VSL-00002D), transfers are limited by the batch control transfer-in or transfer-out operation per vessel. Once the batch control acquires any FRP vessel, no other batch control operation is able to acquire this vessel until it is released from the initial operation. The acquiring and releasing steps ensure that this vessel cannot transfer or receive from multiple destinations at the same time.

When acquired, the transfer-in sequence is initiated. Under normal operating conditions the transfer-in sequence will be completed when either of the following occurs:

- The required batch volume has been transferred and post-transfer flushing and draining are done.
- The last receipt vessel reaches its upper operating limit (UOL)

Once the vessel is released, the PCS can then initiate a transfer-out sequence. Under normal operating conditions the transfer-out sequence can be stopped if any of the following occurs:

- When the level in a waste feed receipt vessel (FRP-VSL-00002A/B/C/D) reaches its low operating limit (LOL).
- A specified volume is transferred.
- The destination vessel reaches its UOL.

For batch volume transfers, the Operator, based on PCS information, confirms that the available space in the destination vessel and the available volume in the sending vessel are consistent with target batch volume specified by the Operator. That means that during the batch transfer the destination UOL and sending LOL are not exceed.

Prior to and during the transfer of feed from the TFC to the waste feed receipt vessels (FRP-VSL-00002A, FRP-VSL-00002B, FRP-VSL-00002C, or FRP-VSL-00002D), there is data exchange between the WTP and the TFC to ensure a safe transfer operation and to prevent any overflows. This data interface is regulated through control systems hardwired signals (permissives and trips) exchange.

The transferring process from the TFC to the WTP stops if the "HIGH-HIGH" Level in Ultimate Overflow Vessel PWD-VSL-00033 alarm" is activated. This PCS action stops the transferring pump on the TFC side and closes the inlet and outlet valves on all waste feed receipt vessels (FRP-VSL-00002A, FRP-VSL-00002B, FRP-VSL-00002C, and FRP-VSL-00002D). This interruption occurs regardless of the current status of the transferring operation. During the entire transfer-in or transfer-out sequence, the PCS monitors the sump alarms within the PTF and notifies the operator if an alarm condition occurs. The operator can then manually stop the transfer or allow the batch control to switch to an exception handling logic.

When the level in any of the waste feed receipt vessels (FRP-VSL-00002A, FRP-VSL-00002B, FRP-VSL-00002C, and FRP-VSL-00002D) is no longer within the normal operating range, control system interlocks will prevent an overflow condition. Upon reaching the "HIGH-HIGH" level, the PCS indicates an alarm to the operator and automatically stops transferring pumps on the TFC side and closes the inlet valves.

Each step in the batch operation will be performed automatically with built-in operator prompts as dictated by the pre-transfer, during-transfer, and post-transfer operator/PCS interfaces and controls listed below.

Action	The Goal of the Action
• Select receiving vessels	This will allow proper valve alignment thereby preventing misrouting of feed within FRP
• Select one of the three transfer lines	This will allow proper valve alignment thereby preventing misrouting of feed to WTP.
• Specify the feed volume for each receipt vessel, based on the available volume (in US gallons), including flush volume	This will control vessel filling level, vessel filling sequence, and prevent overflow
• Operator enables permissive to start transfer	This will authorized initiation of transfer operation
• Confirm start (via flow totalizer) of transfer	This ensures that the valves are aligned properly.
• Confirm receipt of feed via level in the vessel and flow totalizer instrumentation.	This ensures a controlled operation.
• Disable permissive to stop transfer when the target volume in the last receipt tank is achieved	This will prevent overflow of the waste feed receipt vessels (FRP-VSL-00002A/B/C/D)
• Confirm that volume is available in the HLW effluent transfer vessel (PWD-VSL-00043) to receive transfer line post-flush drain.	This will prevent overflow to the ultimate overflow vessel (PWD-VSL-00033).
• Drain pipeline flush	This will ensure that no flush liquid remains in the lines
• Secure valving.	This will ensure that the valves are in the proper position after the transfer.
• Calculate the actual feed volume and flush volume received from the TFC.	This will confirm receipt of actual amount of waste and flush from TFC for record keeping

The following are interlocks between the WTP and the TFC that are working all the time. The interlocks are done using hardwire signal cables originating at WTP control system and terminating at the TFC's control system. These signals tie into interlock logic performed within each of the control systems. These trips disable the transfer permissive.

Interlock Signal	Usage
• "HIGH-HIGH" level interlock in ultimate overflow vessel (PWD-VSL-00033)	This signal will be used as a trip in the TFC master pump shutdown logic to stop the transfer, preventing an overflow of the ultimate overflow vessel (PWD-VSL-00033).
• "HIGH" level interlock in transfer line leak pot	This signal is used as a trip in the TFC master pump shutdown logic to stop the transfer upon failure of primary containment and preventing overflow of the ultimate overflow vessel (PWD-VSL-00033).
• The "HIGH" level interlock in black cell or hot cell sumps	This will prevent initiation or stop transfer if vessel and piping integrity within PTF is suspect
• "HIGH-HIGH" level interlock in any receiving vessel	This will prevent an overflow condition in the FRP system
• Valves are not properly aligned in WTP facility for transfer from TFC	This signal will be used as a permissive to start the transfer from the TFC to WTP to avoid deadheading of the transfer pump, and will prevent a misroute.
• Control valves or associated instrumentation are not functional.	This will ensure that the transfer can be monitored and controlled.
• Operator disables transfer	This signal will be used as a trip in the TFC master pump shutdown logic to stop the transfer pump.

Figures 1, 2, 3, and 4 show the interlocks and alarms for level instruments associated with the waste feed receipt vessels (FRP-VSL-00002A, FRP-VSL-00002B, FRP-VSL-00002C, and FRP-VSL-00002D).

3.1.2 Waste Feed Return Pump

There is the capability to return waste from FRP system and vessels in HLP system (HLP-VSL-00022, HLP-VSL-00027A, HLP-VSL-00027B, and HLP-VSL-00028) back to the TFC through the FRP system. This transfer is also controlled by a transfer-out batch control operation with built-in pre-start and post-transfer Operator/PCS interfaces and controls and hardwired data exchanges between the WTP and the TFC.

The waste feed return pump (FRP-PMP-00001) will be used to return waste from the FRP and the HLP systems to the tank farms through one of the three transfer pipelines. The return of off-specification waste feed will be followed by a flush consisting of up to three pipeline volumes of inhibited water from the flush tank (SHR-TK-00009). The flush will flow from the PT facility to the tank farms. Following the flush, liquid remaining in the pipeline will be gravity-drained from the high point in the line back to the HLW effluent transfer vessel (PWD-VSL-00043).

On the discharge section of the pump there is a flow meter (FRP-FT-0309) that measures flow through the pump. Based on flow measuring, the PCS calculates the amount of waste and flushing water that has been transferred through the pump. This calculation, along with a similar calculation based on level changes in the receiving vessel, is used to control the transfer.

Figure 5 shows the interlocks and alarms for flow associated with the waste feed return pump (FRP-PMP-00001). Also Figure 5 shows the control logic for this pump.

3.1.3 Waste Feed Transfer Pump

The waste feed transfer pump (FRP-PMP-00002A) is used for transferring waste to the waste feed evaporator feed vessels (FEP-VSL-00017A and FEP-VSL-00017B), ultrafiltration feed preparation vessels (UFP-VSL-00001A and UFP-VSL-00001B), and treated LAW concentrate storage vessel (TCP-VSL-00001). This pump will also be used for transferring waste to any vessel within the FRP system.

On the discharge section of the pump there is a flow meter/totalizer (FRP-FT/FQI-0352) that measures flow through the pump. Based on flow measuring, the PCS calculates the amount of waste and flushing water that has been transferred through the pump. This calculation, along with a similar calculation based on level changes in the receiving vessel, is used to control the transfer.

Some transferring within PTF, utilized the waste feed transfer pump (FRP-PMP-0002A), will be followed by a water flush. After flushing is complete, liquid remaining in the pipeline will drain to the ultimate overflow vessel (PWD-VSL-00033).

The waste feed transfer pump (FRP-PMP-00002A) stops, if the "HIGH-HIGH" level alarm in ultimate overflow vessel (PWD-VSL-00033) is activated. This action interrupts any current waste transferring or flushing from FRP system to the FEP/UFP/TCP systems or any transferring from within FRP.

Figure 6 shows the interlocks and alarms for flow associated with the waste feed transfer pump (FRP-PMP-00002A). Also Figure 6 shows the control logic for this pump.

Figure 1. FRP-LI-0103 for Waste Feed Receipt Vessel (FRP-VSL-00002A)

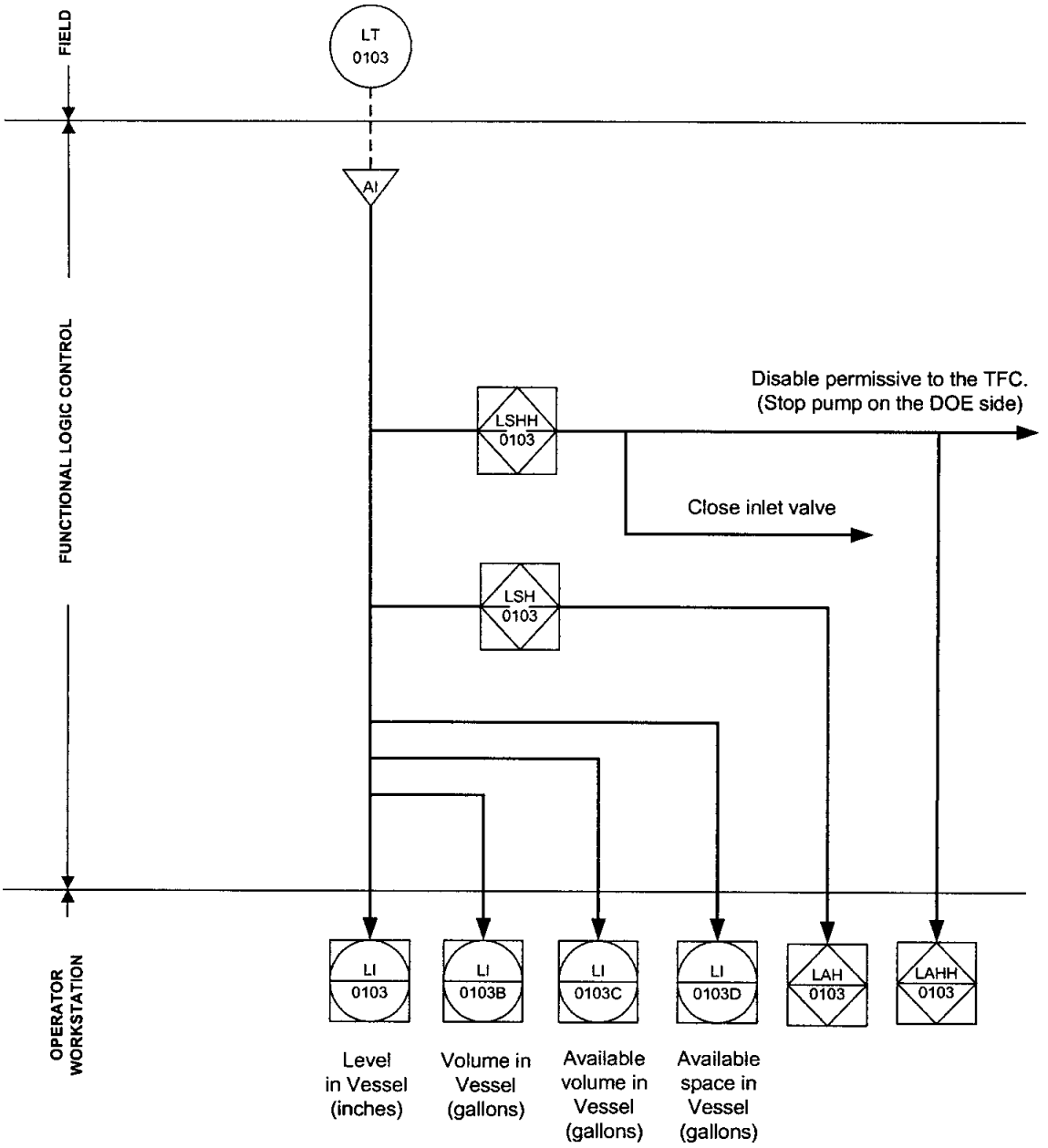

Figure 2. FRP-LI-0108 for Waste Feed Receipt Vessel (FRP-VSL-00002B)

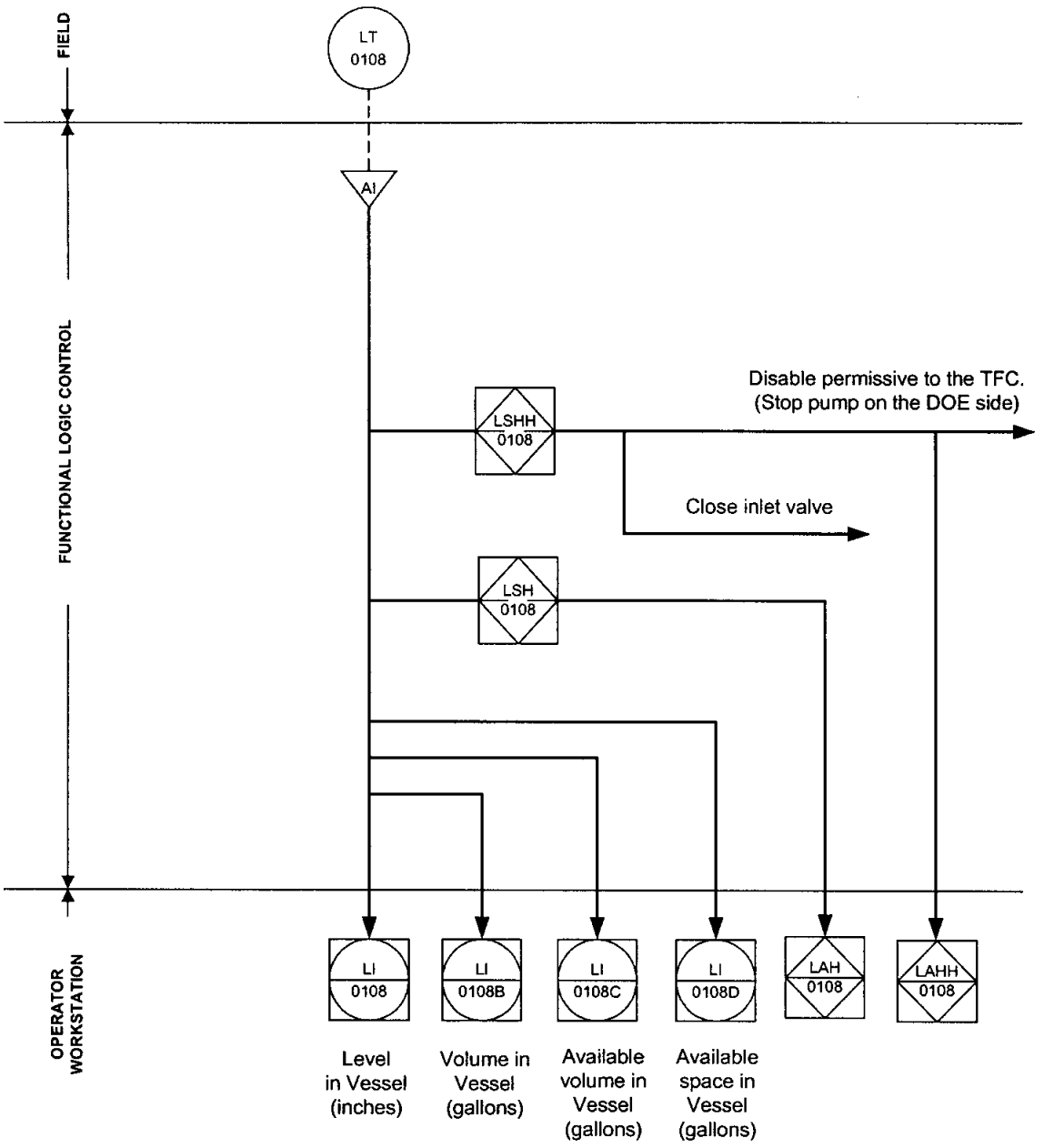

Figure 3. FRP-LI-0203 for Waste Feed Receipt Vessel (FRP-VSL-00002C)

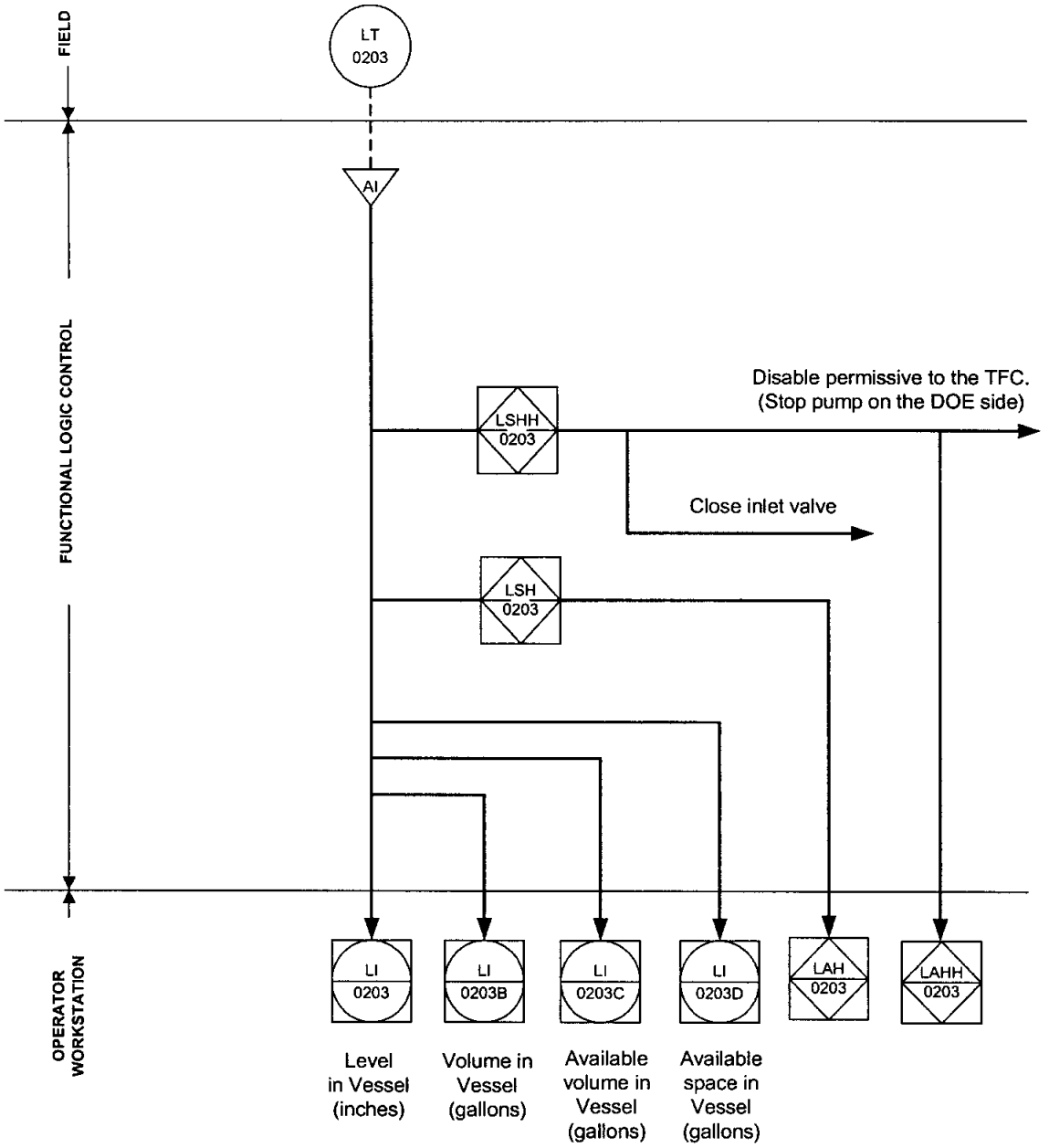

Figure 4. FRP-LI-0208 for Waste Feed Receipt Vessel (FRP-VSL-00002D)

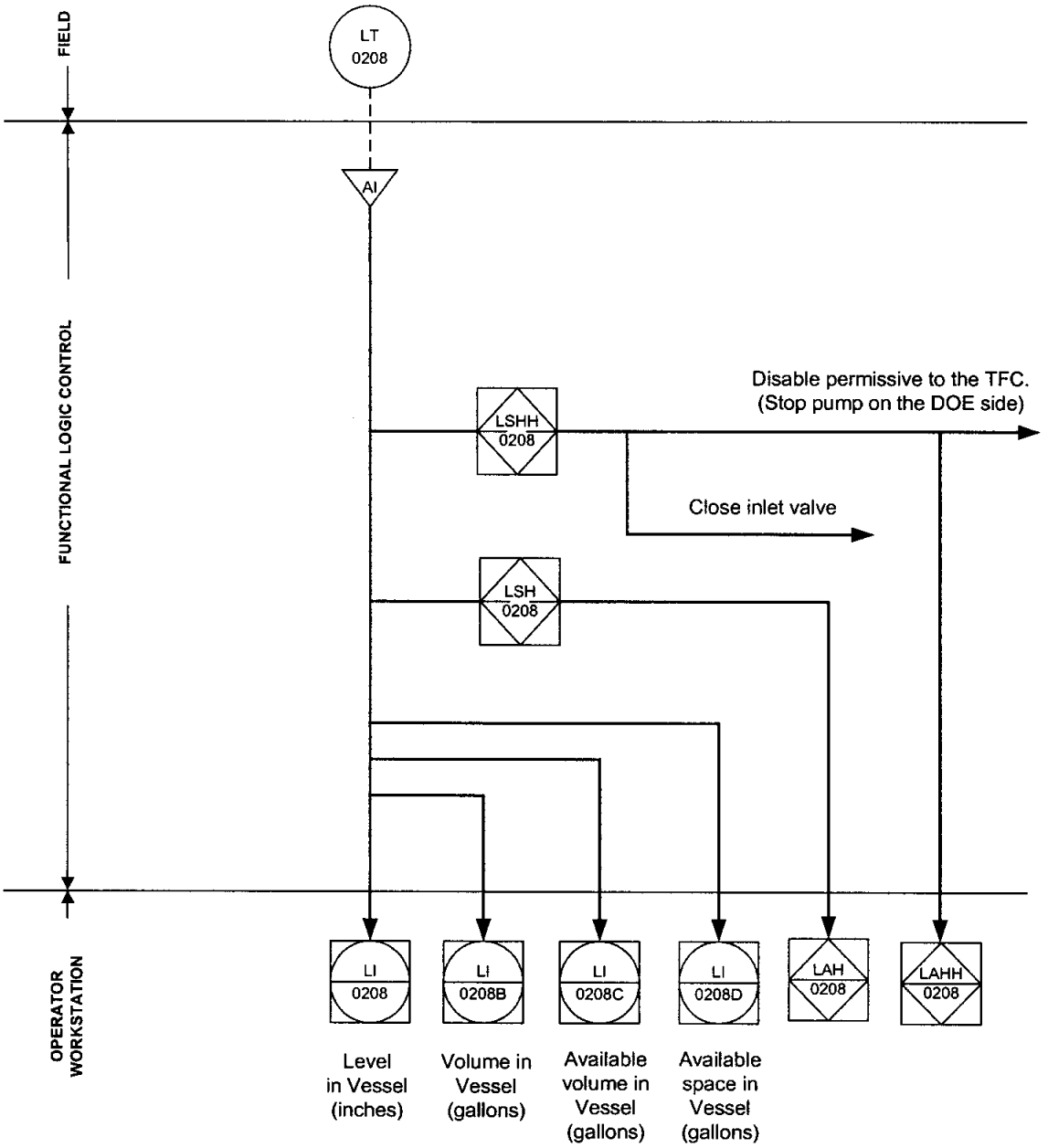

Figure 5. FRP-FI-0309/FRP-FQI-0309 for Waste Feed Return Pump (FRP-PMP-00001)

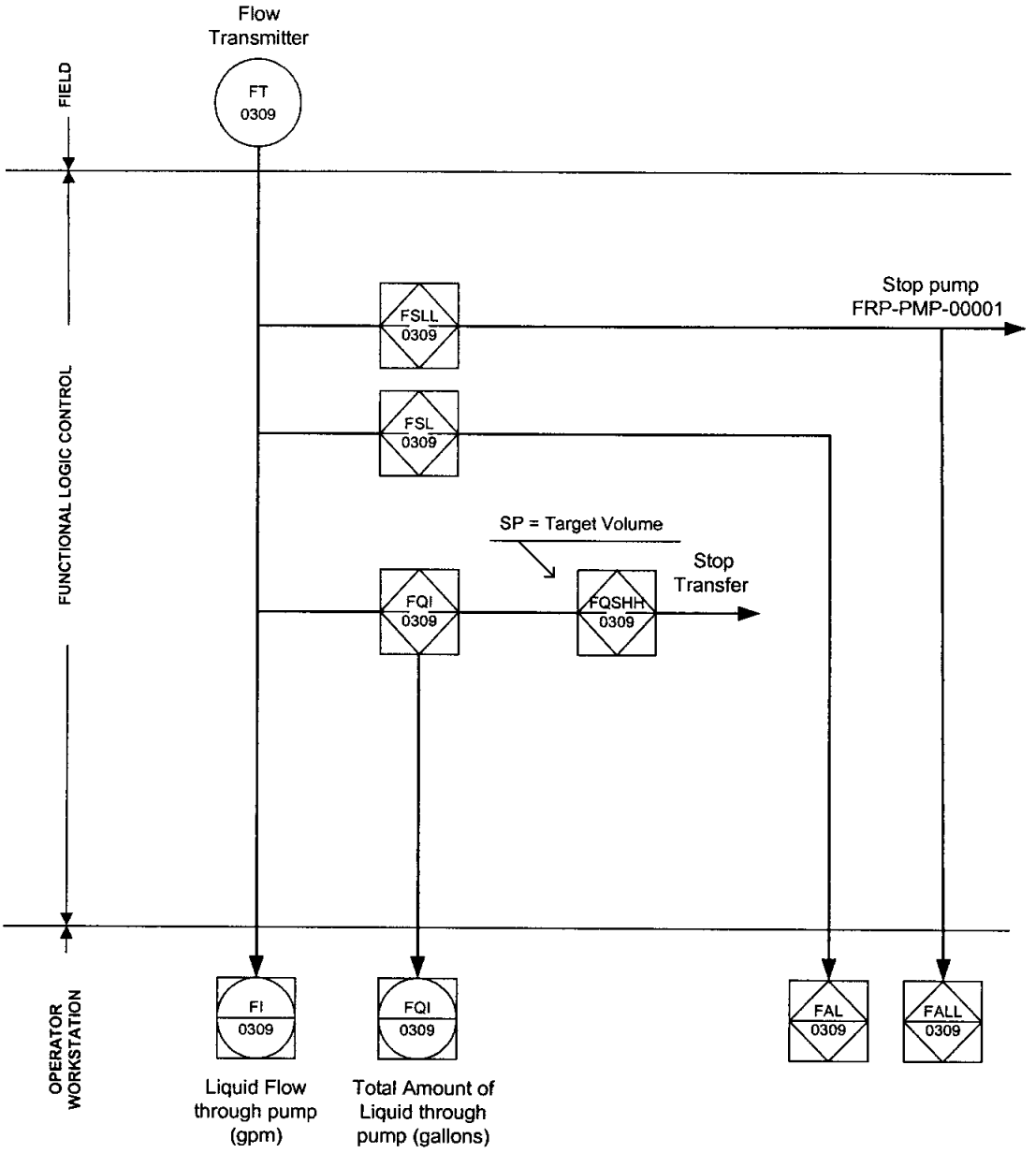

Figure 6. FRP-FI-0352/FRP-FQI-0352 for Waste Feed Transfer Pump (FRP-PMP-00002A)